

AUSTRALASIAN CERATOPOGONIDAE (DIPTERA, NEMATOCERA)

PART XIII: AUSTRALIAN AND NEW GUINEA SPECIES OF ECHINOHELEA MACFIE

MARGARET L. DEBENHAM

School of Public Health and Tropical Medicine, University of Sydney

(35 Text-figures)

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Synopsis

Until recently the biting midge genus *Echinohelea* Macfie was known only from the Nearctic and Neotropical regions, with four described species. A species from Africa was described in 1959, and in 1963 and 1966 Tokunaga described six species from New Guinea. In the present paper, the genus is recorded for the first time from Australia, with two new species, and three further New Guinea species are described. In addition, new records are provided for some of Tokunaga's species, and a key to the known Australian and New Guinea species is given.

Genus ECHINOHELEA Macfie

Echinohelea Macfie, 1940, *Proc. r. ent. Soc. London*, (B), 9 (11): 187
(Type species, *Echinohelca ornatipennis* Macfie, by original designation).

Diagnosis: Eyes bare. Antennal segments long and slender, distal five elongated in both sexes, male without antennal plume, sparse verticils present in both sexes, these longer in the male, some antennal segments bearing sensory pits surrounded by fine cilia, these always present on the basal flagellar segment, sometimes on other segments. Maxillary palp long and slender, 5-segmented, third segment with a preapical sensory pit. Thorax without anterior tubercle. Legs with stout, often long, black spines on all femora and most, or all, tibiae, these spines scattered rather irregularly, male sometimes with long, delicate hairs on legs; tarsal segment IV short, not distinctly cordate or bilobed, segment V long, unarmed, not inflated. Female claws equal or unequal, with an internal basal tooth, male claws equal, with or without a basal tooth. Wing without macrotrichia, with two radial cells, the second much longer than the first, costa extending to just over $\frac{3}{4}$ of wing length, not prolonged beyond junction with R_{4+5} , M_2 arising at or just before r-m. Abdomen of female with sternites VI-VIII fused into a more highly sclerotized, subtriangular genital plate bearing the gonopore in a cleft on its posterior margin; a single large spermatheca usually with hyaline punctures. Male genitalia large, bent under abdomen, the coxites bulbous, separating the reduced sternite and tergite completely, styles short and stout, only slightly curved, ninth sternite a subtriangular plate connected by a spiculate membrane to the base of the aedeagus, ninth tergite displaced distally, narrow and elongate, bearing a pair of apicolateral triangular lobes; aedeagus with a broad, rounded basal arch, distally produced into a pair of contiguous, or almost contiguous, slender lobes which sometimes bear subapical lateral points; parameres separate or fused along midportion, with a basal laterally produced process, stem slender, distal portion usually bent or recurved laterally, modified into various shapes.

Despite the sessile median fork, this genus is allied to *Stilobezzia* and related genera rather than the *Palpomylia* group of genera (Wirth, 1962).

METHOD OF DESCRIPTION

Unless otherwise stated, descriptions are based on specimens cleared in a mixture of 1 part absolute alcohol to 1 part creosote and mounted in balsam on microscope slides. When necessary, male genitalia were further cleared in KOH.

Table of measurements: Dimensions of newly described species are based on the holotype and, where available, the allotype. In these, wing length is measured from the basal arculus to the wing tip. Dimensions of species described previously by Tokunaga are taken directly from the published descriptions, except for the measurements of the mid femur and tibia of *Echinohelea zonata* Tokunaga which are taken directly from the holotype, as they were not given in the original description. Wing length in Tokunaga's species is measured from the incision between squama and alula, which gives a slightly greater value than the measurement used for new species. Dimensions of the newly described male of *Echinohelea flava* Tokunaga are based on a selected specimen which has been suitably labelled as such.

Morphological terms: These are based on Wirth (1952) with the following substitutions: in the female, cerci for lamellae; in the male, coxite and style for basistyle and dististyle. The length of the proboscis is measured from its junction with the clypeus to its tip; the height of the head is measured from the junction of the proboscis and clypeus to the upper margin of the eyes. The palpal ratio is the length of the third palpal segment divided by its maximum breadth. The tarsal ratio is the length of the first tarsal segment divided by the length of the second tarsal segment. The costal ratio is the length of the costa divided by the length of the wing.

Illustrations: These were done using a compound microscope, with the aid of a graticule and squared paper. All are based on type specimens unless otherwise stated.

Location of types: Types of newly described species are lodged in the collection of the School of Public Health and Tropical Medicine (SPHTM), Sydney, and the Australian National Insect Collection (A.N.I.C.), Canberra, A.C.T. Types of Tokunaga's species are in the B. P. Bishop Museum, Honolulu.

Key to Australian and New Guinea Species of ECHINOHELEA

1. Wing with two dark costal spots *pictipennis* Tokunaga
Wing without spots, entirely hyaline or anterior portion enfuscated 2
2. Hind tibia entirely yellow, apex sometimes brownish 3
Hind tibia largely brown 6
3. Scutum largely brown, or with conspicuous brown markings 4
Scutum yellow, with only inconspicuous fuscous areas 5
4. Scutum reddish-brown with humeral areas yellow, all coxae yellow, proboscis long, $\frac{3}{4}$ the height of the head *longirostris*, n. sp.
Scutum yellow with brown markings on anterior margin and posterior half, mid and hind coxae brown on apical half, proboscis less than $\frac{3}{4}$ the height of the head *moresbyensis*, n. sp.
5. Femora of all legs with 6 or more spines *flava* Tokunaga
Mid and hind femora with 1 or 2 spines *papuensis* Tokunaga
6. Hind femur with apical fourth either entirely brown, or brown interrupted by a whitish median band 7
Hind femur not marked as above 8
7. Small species, about 1.5 mm. long, hind femur with apex brown and a brown preapical band, and a single preapical spine *notipes*, n. sp.
Large species, over 2 mm. long, hind femur broadly brown apically, with about 15 spines in ♂, 6-7 in ♀ *australiensis*, n. sp.
8. Hind femur with about 14 or more spines, fore tibia with 1-2 spines 9
Hind femur with fewer than about 8 spines, fore tibia without spines 10

9. Large species, over 2 mm. long, abdomen yellow with extensive brown markings *zonata* Tokunaga
 Small species, about 1.2 mm. long, abdomen almost entirely yellow .. *pallida*, n. sp.
10. Caudoscutal area without fuscous markings, ♀ with mid and hind claws unequal *hardyi* Tokunaga
 Caudoscutal area with faint fuscous markings, ♀ claws all equal .. *laensis* Tokunaga

ECHINOHELEA PICTIPENNIS Tokunaga

Echinohelea pictipennis Tokunaga, 1963, *Pac. Insects*, 5 (1): 231. (*Type locality*: Amok, 165 m., NE New Guinea. *Allotype* ♂ from Gurakor village, 950 m., Wampit Valley, nr. Wau, NE New Guinea; *paratype* ♂ from Waris, 450–500 m., S of Hollandia, NW New Guinea; *paratype* ♀ from Swart Valley, 1300–1350 m., W Fork, NW New Guinea.)

Specimens examined: 3 ♂♂, 1 ♀, Malaria Control Sect., Maprik, New Guinea¹ (iv.1958).

A large species, over 2 mm. long, thorax yellow with fuscous markings, legs yellow except the hind tibia which has apex and basal two-thirds dark brown, wing with brown spots over r-m cross vein and at end of R₄₊₅, haltere pale, abdomen yellow, tergites brown laterally and on posterior margins, parameres with long, sharply pointed apicolateral processes.

The specimens examined differ slightly from the type in having the head yellowish-brown, and the female with a basal spine on the first tarsal segment and a smaller spermatheca (0.072 × 0.070 mm.). Femoral spines of males: fore with 13–14 [10–13 in type series], mid with 13–14 [10–12], hind with 13–15 [15]; tibial spines of males: fore with 1 [1], mid with 2–3 [2–5], hind with 8–9 [8–11]. Femoral spines of female: fore with 9 [9–10], mid with 13 [12–13], hind with 13 [14–15]; tibial spines of female: fore with 1 [1], mid with 4 [4], hind with 8–9 [9–11].

This is the only spotted-winged species so far described from the area. Wirth (unpublished MS) records *pictipennis* from the Philippines, but this may be a new species, the hind tibia having only the basal half brown, the male hind tibia being more spinose (13 spines), and the apicolateral processes of the male parameres begin shorter and more rounded.

Distribution: Northern New Guinea; Philippines (?).

ECHINOHELEA LONGIROSTRIS, n. sp.

Type: Holotype ♀, in SPHTM.

Type locality: Malaria Control Sect., Maprik, New Guinea (1958).

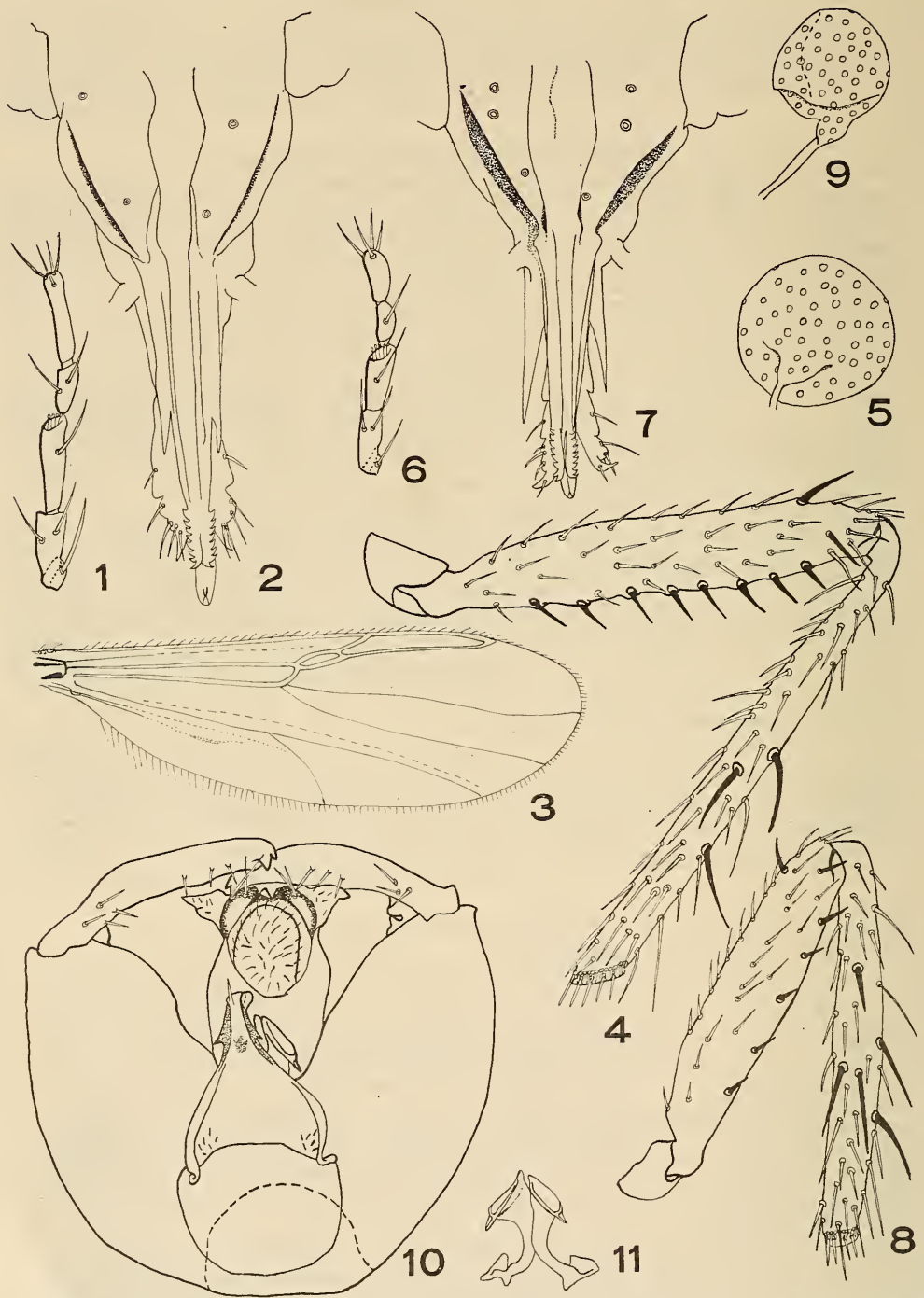
This species is very similar to *flava* and *moresbyensis*, but is readily distinguished by the scutal coloration. Male unknown.

Female: Length 1.50 mm., wing 1.30 × 0.43 mm.

Head light brown, vertex and frons yellow. Proboscis long and narrow, $\frac{2}{3}$ the height of the head (Fig. 2). Eyes bare, just contiguous. Mandibular teeth eight. Palp pale yellowish, long and slender, segment III with a shallow preapical sensory pit, palpal ratio 3.2 (Fig. 1). Antennal segment II ochreous, flagellum missing.

Scutum reddish-brown except for humeral areas, which are yellow, scutellum and postscutellum brownish-ochreous, scutellum with 6 large setae, pleuron yellow. All coxae, trochanters, femora and tibiae yellow, fore femur with 8–9 spines, mid femur with 12–13, hind femur with 10, fore tibia with 0,

¹Specimens with the data "Malaria Control Section, Maprik, New Guinea" are part of bulked light trap collections sent to SPHTM for study by Dr. W. Peters.



Figs. 1-5. *Echinohelea longirostris*, n. sp. 1, ♀ maxillary palp, × 200; 2, ♀ proboscis, × 200; 3, ♀ wing, × 55; 4, ♀ hind femur and tibia, × 100; 5, ♀ spermatheca, × 200. Figs. 6-11. *Echinohelea flava* Tokunaga. 6, ♀ maxillary palp, × 200; 7, ♀ proboscis, × 200; 8, ♀ hind femur and tibia, × 100; 9, ♀ spermatheca, × 200; 10, ♂ hypopygium (Maprik specimen), × 200; 11, ♂ parameres (Maprik specimen), × 200.

mid tibia with 2, hind tibia with 2-3, hind tibial comb of about 5 pale spines (Fig. 4); tarsi yellowish, the fifth segment fuscous, tarsal spines: fore I with 1 apical, 1 basal, II-III with 1 apical; mid I with 1 basal, 1 apical, II-III 1 apical; hind I with 1 basal, III 2 apical; tarsal ratios of fore, mid and hind legs 1.80, 1.89 and 2.53 respectively. Claws of all legs paired, equal, about $\frac{1}{2}$ the length of the fifth tarsal segment, each claw with an internal basal tooth.

Wing (Fig. 3) with veins light brown; intercalary fork not distinct; costal ratio 0.84, lengths of first and second radial cells 0.098 mm. and 0.353 mm. respectively. Haltere pale fuscous yellow.

Abdomen yellow, more ochreous distally, posterior margins of segments dark brown; cerci brown. Spermatheca brown, oval, with hyaline punctures, 0.102 mm. \times 0.098 mm., with a short chitinized neck (Fig. 5).

As well as the dark scutum, this species differs from *flava* Tokunaga in having a longer proboscis, longer, more slender palp, and more spinose mid and hind femora. It differs from *moresbyensis* n. sp. in the more extensively brown scutum, entirely yellow coxae, longer palp and longer proboscis, more spinose mid femur and less spinose hind femur and tibia.

Distribution: Known only from the type locality.

ECHINOHELEA MORESBYENSIS, n. sp.

Type: Holotype δ , in SPHTM.

Type locality: Musgrave R., near Port Moresby, New Guinea (25.ii.1964, D. H. Colless).

This species is distinguished from other species with yellow legs by the scutal coloration and brown apices of mid and hind coxae. Female unknown.

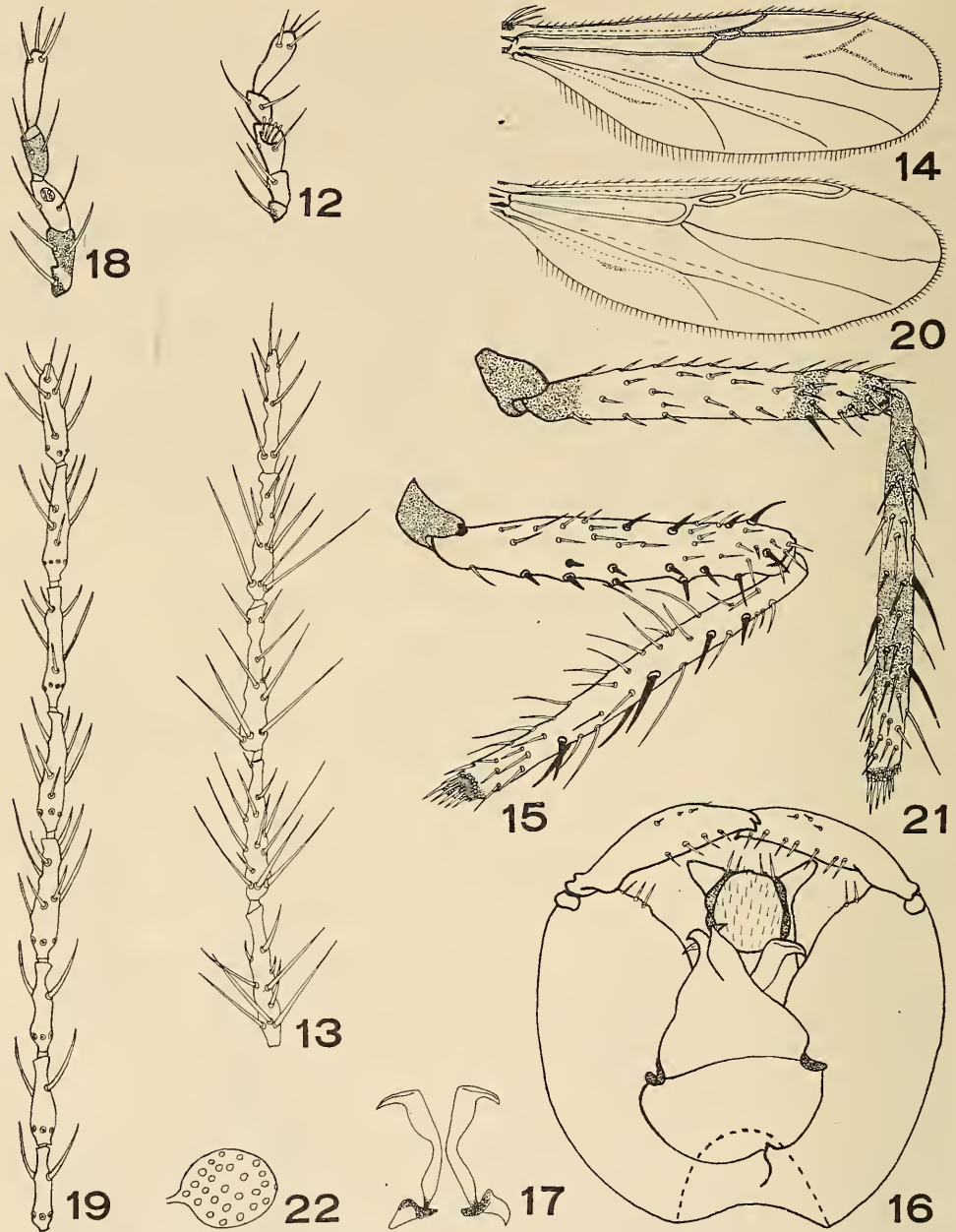
Male: Length 1.14 mm., wing 1.00 \times 0.34 mm.

Head light brown. Proboscis just under $\frac{1}{2}$ the height of the head. Eyes bare, broadly contiguous. Palp light brown, rather short, segment III with a large preapical sensory pit, palpal ratio 2.0 (Fig. 12). Antennal segment II ochreous, III-X light brown basally, darker brown apically, XI-XV brown (Fig. 13).

Scutum yellow with brown markings on anterior and anterolateral margins and posterior half, scutellum fuscous yellow, with six large setae, postscutellum brown on anterior half, yellow on posterior half, pleuron yellow with some brownish markings. Fore coxa pale yellowish-brown, mid and hind coxae yellow on basal half, brown on apical half, fore and mid trochanters yellow, hind brown; femora and tibiae yellow, knees slightly fuscous; hind femur with a very pale preapical fuscous cloud, hind tibia narrowly brown apically, fore and mid femora each with 9 spines, hind femur with 14, fore tibia with 1, mid tibia with 2, hind with 6, hind tibial comb of 5 spines (Fig. 15); tarsi whitish, the fifth segment fuscous, tarsal spines: fore I with 1 apical, II-III with 1 apical; mid I with 1 basal, 2 apical, II-III 2 apical; hind I with 1 basal, III with 1 apical; tarsal ratios of fore, mid and hind legs 1.94, 1.68 and 2.32 respectively. Claws of all legs paired, equal, about $\frac{1}{2}$ the length of the fifth tarsal segment, each claw with an internal basal tooth.

Wing (Fig. 14) with veins light brown; intercalary fork distinct; costal ratio 0.82; lengths of first and second radial cells 0.068 and 0.266 mm. respectively. Haltere fuscous.

Anterior abdominal segments fuscous yellow with posterior borders light brown, posterior segments light brown, pleural membranes brown. Hypopygium (Figs 16-17) fuscous yellow, styles dark brown; aedeagus with a very



Figs. 12-17. *Echinohelea moresbyensis*, n. sp. 12, ♂ maxillary palp, × 200; 13, ♂ antennal segments XI-XV, × 200; 14, ♂ wing, × 55; 15, ♂ hind femur and tibia, × 100; 16, ♂ hypopygium, × 200; 17, ♂ parameres, × 200. Figs. 18-22. *Echinohelea notipes* n. sp. 18, ♀ maxillary palp, × 200; 19, ♀ antennal segments VIII-XV, × 200; 20, ♀ wing, × 55; 21, ♀ hind femur and tibia, × 100; 22, ♀ spermatheca, × 200.

low basal arch, divided apically into two lobes, each with a small, sharp, apicolateral point, parameres expanded on apical half, with short, tapering apicolateral processes.

This species is distinguished from *flava* Tokunaga by the brown markings on the thorax and coxae, and from *longirostris* n. sp. by the more yellowish scutum, brown apices on the coxae, less spinose mid femur and more spinose

hind femur and tibia, shorter proboscis and palp, and more distinct intercalary fork in wing.

Distribution: Known only from the type locality.

ECHINOHELEA FLAVA Tokunaga

Echinohelea flava Tokunaga, 1963, *Pac. Insects*, 5 (1): 235 ♀ only. (*Type locality*: Lowlands Agr. Stat., Keravat, New Britain.)

A female and 2 males collected from Maprik, New Guinea, and a single male from Guadalcanal Island, Solomon Islands (in the USNM) of a different species to the Maprik specimens, all agree with Tokunaga's original description of *E. flava* in general details. The males of both differ in having more spinose legs, the Maprik males having 10 spines on the fore femur, 10 on the mid femur and 12-13 on the hind femur, 1 on the fore tibia, 2-3 on the mid tibia and 5-6 on the hind tibia, the Guadalcanal I. male having 10, 12 and 17 spines on the femora and 1, 3 and 7 spines on the tibiae. However, the leg spinosity of the female from Maprik is similar to that of the holotype of *flava*, and possibly the females of the Guadalcanal species are also less spinose than the males. Here, the Maprik specimens are tentatively assigned to *flava* on the basis of the number of large scutellar setae (6, as in the holotype of *flava*, compared to 8 in the Guadalcanal I. specimen) and the number of supra-alar setae (7-9 in Maprik specimens, 8-9 in holotype, 13 in Guadalcanal I. specimen). Confirmation of this assignation will depend on collection of both females and males identifiable as *E. flava* from the type locality.

Specimens examined: 1 ♂, 1 ♀, Malaria Control Sect., Maprik, New Guinea (iv.1958); 1 ♂, same locality (vii.1958). Holotype ♀ also examined (Figs 6-9).

Male (description based on specimen collected in April, 1958): Length 1.36 mm., wing 1.08 × 0.36 mm.

Generally similar to female, differing as follows:

Legs more spinose (see above); tarsal spines as in female (note: holotype has fore tarsus I with 1 basal and 1 apical spine, as do present specimens), tarsal ratios of fore, mid and hind legs, 1.90, 2.00 and 2.62 respectively. Claws as in female, each $\frac{1}{2}$ the length of the fifth tarsal segment.

Costal ratio of wing 0.76, lengths of first and second radial cells 0.076 mm. and 0.266 mm. respectively.

Hypopygium (Figs 10-11) yellow, styles brown; aedeagus with median distal portion divided into two pointed lobes, each bearing a small subapical lateral point, parameres short, thickened on apical half, the apices flattened and somewhat anvil-shaped.

This species is distinguished from *papuensis* Tokunaga by the more spinose legs. The genitalia of the Guadalcanal Island species differ in having the apex of the aedeagus without lateral subapical points, and the parameres more slender and with pointed subapical ventrolateral processes.

Distribution: New Britain, northeastern New Guinea.

ECHINOHELEA PAPUENSIS Tokunaga

Echinohelea papuensis Tokunaga, 1966, *Pac. Insects*, 8 (1): 112. (*Type locality*: Mendi, 1660 m., S Highlands, SE New Guinea. *Allotype* ♂ from Matoko, Main Finisterre Range, Saidor Subdistrict, NE New Guinea.)

A medium sized species, almost entirely yellow as in *flava*, but legs much less spinose, femoral spines (in both sexes): 5 on fore, 1 on mid, 2 on hind; tibial spines: 0 on fore, 2 on mid, 3-4 on hind. Wings hyaline. Aedeagus

of male with subapical lateral points, parameres with apical parts flattened and triangular.

Distribution: Eastern New Guinea.

ECHINOHELEA NOTIPES, n. sp.

Type: Holotype ♀, in SPHTM.

Type locality: Crystal Cascades, Cairns, N. Qld. (19.iv.1967, D. H. Colless).

A medium-sized species with legs distinctively banded, and with few spines. Male unknown.

Female: Length 1.47 mm., wing 1.05×0.37 mm.

Head brown. Proboscis $\frac{1}{2}$ the height of the head. Mandible with 8 teeth. Palp light brown except for segments III and V which are whitish, III with a shallow preapical sensory pit, palpal ratio 2.2 (Fig. 18). Antennal segment II ochreous, III brown, IV-X light brown with basal half to one-third whitish, XI-XII brown, bases paler, XIII-XV brown, all segments with a basal verticel (Fig. 19).

Scutum yellow, but with a brown median longitudinal band on anterior half, posterior half brown dorsally, and a narrow transverse brown band behind each humeral area not quite reaching the median band. Scutellum yellow, brownish anteriorly and centrally, postscutellum brown, pleuron yellow with irregular brown areas. Fore coxa brown, mid and hind coxae yellow with dark brown apices, fore trochanter pale brown, mid and hind trochanters darker brown; legs pale whitish-yellow, fore femur with base pale brown and two pale brown bands, one just before centre and one past centre, mid femur with base light brown and a single pale brown preapical band, hind femur with base and apex brown and a brown preapical band, fore and mid tibiae with bases pale fuscous, apices brown, and a broad, very pale brown preapical band, hind tibia brown with a yellowish sub-basal and whitish preapical band (Fig. 21); spines on fore femur 5, on mid femur 2, on hind femur 1, on fore tibia 0, on mid tibia 1-2, on hind tibia 3, hind tibial comb of 6 spines; tarsi fuscous except basal half of hind segment I, which is brown, tarsal spines: fore I with 1 basal, 1 apical, II-III with 1 apical; mid I with 1 basal, 1-2 ventral, 2 apical, II-III 2 apical; hind I with 1 basal; tarsal ratios of fore, mid and hind legs 2.10, 2.15 and 2.27 respectively. Claws of all legs paired, equal about $\frac{1}{2}$ the length of the fifth tarsal segment, each with an internal basal tooth.

Wing (Fig. 20) with veins light brown; intercalary fork not distinct; costal ratio 0.79, lengths of first and second radial cells 0.095 mm. and 0.220 mm. respectively. Haltere brown, apex of knob paler.

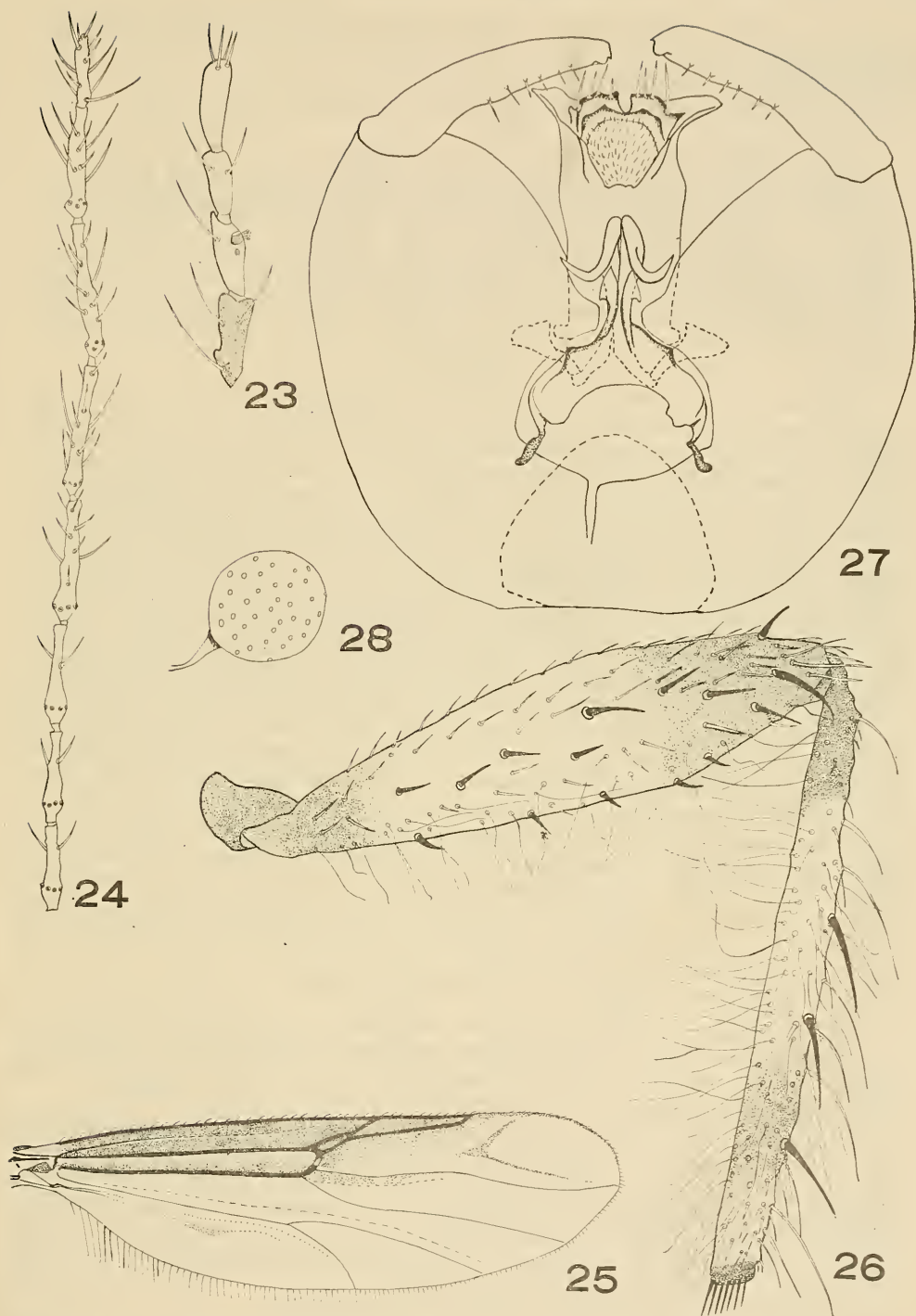
Abdomen brown, segments darker brown on posterior margins; cerci dark brown. Spermatheca brown, oval, with hyaline punctures, 0.060×0.049 mm., with a short chitinized neck (Fig. 22).

The markings on the thorax and legs of this species are similar to those of *australiensis* n. sp., but it is readily distinguished by its smaller size and less spinose legs.

Distribution: Known only from the type locality.

ECHINOHELEA AUSTRALIENSIS, n. sp.

Types: Holotype ♂, allotype ♀, in A.N.I.C., and one ♀ paratype (pinned), in SPHTM.



Figs. 23-28 *Echinohelea australiensis*, n. sp. 23, ♂ maxillary palp, $\times 160$; 24, ♂ antennal segments VIII-XV, $\times 160$; 25 ♂ wing, $\times 40$; 26, ♂ hind femur and tibia, $\times 80$; 27, ♂ hypopygium, $\times 160$; 28, ♀ spermatheca, $\times 160$.

Type locality: Uriara State Forest, A.C.T. (14.xii.1960, D. H. Colless). Paratype from Colo Vale, N.S.W. (swept from bog near stream, 17.i.1957, W. W. Wirth).

This species is distinguished by its large size and banded legs.

Male: Length 2.45 mm., wing 1.92×0.62 mm.

Head brown, frons and clypeus more reddish. Proboscis $\frac{1}{2}$ the height of the head. Eyes bare, broadly contiguous. Palp pale yellowish-brown except segments I and II, which are brown, III not swollen, with a large shallow, preapical sensory pit bearing several sensillae, palpal ratio 2.5 (Fig. 23). Antennal segment II dark brown, III yellow with apex brown, IV-IX brown with base yellow, X-XV brown; all segments except XV with a basal verticel of very long hairs; IV-X narrow vasiform, XI-XV slender, not much elongated, XV being very short (Fig. 24).

Scutum yellow with a broad median longitudinal brown band which divides narrowly on the posterior half of the scutum, the two halves extending to the scutellum, a narrow transverse brown band just behind each humeral area not quite reaching the median band, and a diagonal band extending forward from each wing base to join the median band just behind its point of bifurcation, scutellum yellow, brown on lateral ends, postscutellum brown, pleuron yellow with irregular brown bands. Fore coxae and trochanters brown, mid and hind coxae yellow, apical third of coxae and mid and hind trochanters dark brown; femora yellow, bases brown, knee joints dark brown, mid femur with a light brown preapical band, hind femur with apex broadly dark brown, tibiae yellow, apices dark brown, fore and mid tibiae with a broad slightly brownish median band, and a broad pale yellow preapical band, hind tibia with base broadly dark brown, apex narrowly dark brown, and a broad subcentral dark brown band (Fig. 26), hind femora swollen, all femora, tibiae and tarsi with numerous long, delicate, wavy hairs, femora and tibiae with dark spines arranged as follows: on femora, fore with about 14, the ventral ones on large conical tubercles, mid with 11-12, hind with 15; on tibiae, fore and mid with 1 sub-basal, hind with 3-4; hind tibial comb of 7-8 dark spines; tarsi pale yellow except segment V, which is brown, tarsal spines: fore I with 1 basal, 1 apical, II-III 1 apical; mid I with 1 very long basal, 1 long and 1 shorter apical, II-III with 1 long and 1 short apical; hind I with 1 basal, III with 1 apical; tarsal ratios of fore, mid and hind legs 1.46, 2.02 and 2.11 respectively; claws of all legs paired, equal, with internal basal tooth, claws about $\frac{1}{2}$ as long as fifth tarsal segment.

Wing (Fig. 25) with membrane fuscous anteriorly, becoming paler posteriorly, veins brown; microtrichia conspicuous; intercalary fork distinct; costal ratio 0.75, lengths of first and second radial cells 0.117 mm. and 0.383 mm. respectively. Haltere brown, flat part of knob whitish.

Abdomen dark brown, tergite II with a broad yellow transverse band, III-V with a pair of lateral yellowish spots, these becoming progressively smaller and less distinct. Hypopygium (Fig. 27) dark brown except coxites yellowish sub-basally, styles blackish-brown; aedeagus with broad, shallow basal arch, median distal portion divided into two lobes, each with a small lateral preapical point, parameres with long, tapering apicolateral processes.

Female: Length 2.27 mm., wing 1.86×0.59 mm.

Differs from male as follows: Eyes just contiguous. Mandible with 8 teeth, palpal ratio 2.9. Proportions of antennal segments similar to male, hairs of basal verticels shorter, verticel on all segments including terminal one.

Legs lacking long delicate hairs, but with numerous shorter, bristle-like hairs; fewer spines on legs, femora with 11-12 in fore, 8 in mid, 8 in hind, tibiae with 0 in fore, 4 in mid, 6-7 in hind; tarsal spines as in male except mid I also with 1-2 ventral; tarsal ratios—fore 1.71, mid 2.06, hind 2.21; claws as in male.

Radial cells of wing longer, 0.125 mm. and 0.406 mm. respectively.

Spermatheca single, oval, dark brown with small hyaline punctures, 0.182 × 0.171 mm., chitinized neck 0.038 mm. long (Fig. 28).

Details of the coloration of the scutum and abdomen are based on the pinned paratype, as they are not clear in the slide specimens. The paratype differs in having the frons, clypeus and upper eye margins yellow rather than reddish-brown.

Distribution: A.C.T., southern N.S.W.

ECHINOHELEA ZONATA Tokunaga

Echinohelea zonata Tokunaga, 1963, *Pac. Insects*, 5 (1): 234. ♂ only. (*Type locality*: Busu River, E of Lae, 100 m., NE New Guinea.)

Specimen examined: 1 ♂, Malaria Control Sect., Maprik, New Guinea (1958). Holotype ♂ also examined.

A large species, over 2 mm. long, mainly yellow, thorax with fuscous markings, basal half and apex of hind tibia brown (Fig. 34), abdominal tergite I with slender fuscous band on middle part, tergites II-VII with a brown band along posterior margin, this band broadened medially and ventrally. Wing hyaline. Aedeagus without subapical lateral points, parameres with sharply tapering apicolateral processes, similar to *pictipennis*.

The Maprik specimen has fewer spines on the legs than the type, as follows: fore femur with 13-14 [type with 14], mid with 13-14 [15], hind with 17-19 [23]; fore tibia with 1-2 [2], mid with 3 [4], hind with 7-9 [9].

The leg markings of this species are similar to those of *pallida*, n. sp., *hardyi* and *laensis*, but it can be distinguished by its larger size, from *pallida* by the form of the male genitalia, and from *hardyi* and *laensis*, the males of which are unknown, by its more spinose legs.

Distribution: Northern New Guinea.

ECHINOHELEA PALLIDA, n. sp.

Types: Holotype ♂, in SPHTM, and 1 ♂ paratype, in A.N.I.C.

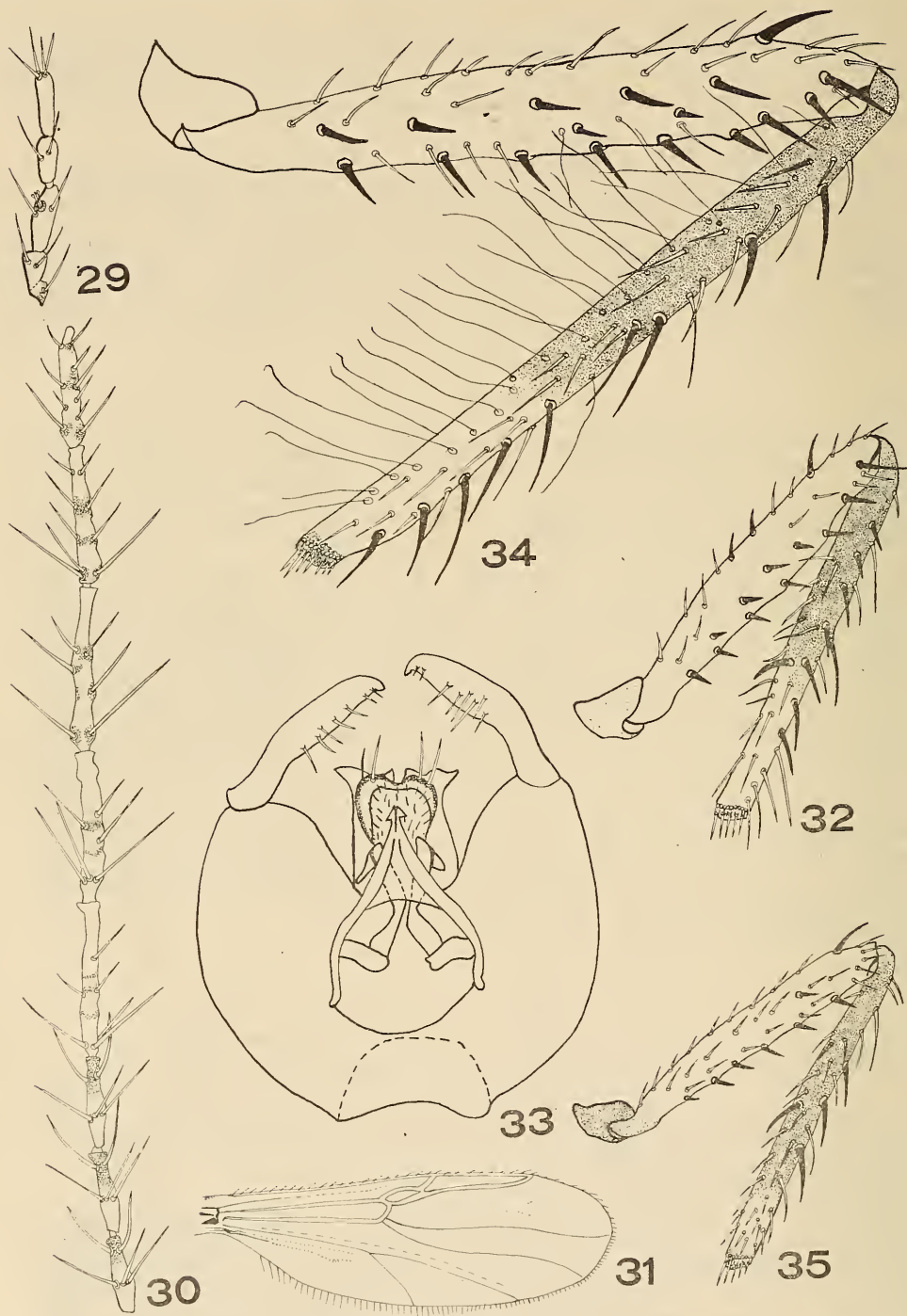
Type locality: Malaria Control Sect., Maprik, New Guinea (holotype 1958; paratype 22.iii.1964, D. H. Colless).

A small, pale species with the basal half of the hind tibia brown, similar to *zonata*. Female unknown.

Male: Length 1.18 mm., wing 0.97 × 0.33 mm.

Head yellow, clypeus and proboscis light brown, proboscis just under $\frac{1}{2}$ the height of the head. Eyes bare, broadly contiguous. Palp whitish, segment III with a shallow preapical sensory pit, palpal ratio 2.7 (Fig. 29). Antennal segment II yellow, III-VII whitish with apices pale brown, VIII-X with basal half whitish, apical half pale brown, XI-XV pale whitish-brown, light brown at bases of some hairs (Fig. 30).

Thorax yellow. Legs yellow except fore femur with central light brown spot dorsally, hind tibia with basal half and apex brown (Fig. 32), femoral spines 8 in fore, 13 in mid, 14-15 in hind, tibial spines 1 in fore, 5-6 in mid,



Figs. 29-33 *Echinohelea pallida*, n. sp. 29, ♂ maxillary palp, × 200; 30, ♂ antennal segments VIII-XV, × 200; 31, ♂ wing, × 55; 32, ♂ hind femur and tibia, × 100; 33, ♂ hypopygium, × 200. Fig. 34. *Echinohelea zonata* Tokunaga, ♂ hind femur and tibia (Maprik specimen), × 100. Fig. 35. *Echinohelea hardyi* Tokunaga, ♀ hind femur and tibia (Maprik specimen), × 100.

8-9 in hind, hind tibial comb of 5 spines; tarsi whitish except segment V, which is fuscous, tarsal spines: fore I with 1 basal, 1 apical, II-III 1 apical; mid I with 1 basal, 2 apical, II-III 2 apical, hind I with 1 basal; tarsal ratios of fore, mid and hind legs 1.84, 1.86 and 2.24 respectively. Claws of all legs paired, equal, about $\frac{1}{2}$ the length of the fifth tarsal segment, each with an internal basal tooth.

Wing (Fig. 31) with veins very pale yellow; intercalary fork not distinct; costal ratio 0.80, lengths of first and second radial cells 0.079 mm. and 0.266 mm. respectively. Haltere pale yellow.

Abdomen pale yellow, the segments light brown laterally. Hypopygium (Fig. 33) deep yellow, styles brown; aedeagus deeply arched, divided medially at the apex, each lobe with a small, sharp lateral subapical point; parameres with short, thick, rounded apicolateral processes.

In the paratype the mid and hind legs have slightly fewer spines, the mid femur having 10, the tibia 4, the hind femur 11-12, the tibia 6-7. This species can be distinguished from *zonata* by its much smaller size, the pale bases of the antennal segments, the less spinose femora, the absence of long, delicate hairs on the legs, and the form of the male genitalia. It differs from *hardyi* and *laensis* in lacking a brown pattern on the scutum, in having the brown on the hind tibia less extensive, the legs more spinose, and the abdomen mainly yellow.

ECHINOHELEA HARDYI Tokunaga

Echinohelea hardyi Tokunaga, 1963, *Pac. Insects*, 5 (1): 235. ♀ only. (Type locality: Kampong Landbouw, 46 m., 30 km. NE of airstrip, Biak, NW New Guinea.)

Specimen examined: 1 ♀, Malaria Control Sect., Maprik, New Guinea (1958); 1 ♀, Doa Estate, 50 m. W of Port Moresby, New Guinea (8.viii.1962, R. Straatman). Holotype ♀ also examined.

A medium-sized, yellow and brown species, thorax yellow but scutum with fuscous clouds, legs mainly yellow, but spot at middle of fore femur, bases of mid and hind femora, and basal third of mid tibia faintly fuscous, hind tibia brown except for preapical yellow band (Fig. 35), female claws unequal on mid and hind legs. Wing hyaline, haltere brown. Abdomen brown.

Number of spines on femora and tibiae of the present specimen is: fore femur 8 [8-9 in type series], mid femur 7 [6-7], hind femur 8 [8], fore tibia 0 [0], mid tibia 2 [2-3], hind tibia 3-4 [2-3].

This species resembles *zonata*, *pallida*, n. sp. and *laensis*. It is distinguished from the first two by its less spinose legs, more extensively dark hind tibia, dark haltere and brown abdomen, and from *zonata* by its smaller size; it is distinguished from *laensis* by the absence of fuscous markings on the caudoscutal area, the presence of 2 apical spines on mid and hind fourth tarsal segments, the unequal claws on the mid and hind legs of the female, and the smaller spermatheca.

Distribution: New Guinea.

ECHINOHELEA LAENSIS Tokunaga

Echinohelea laensis Tokunaga, 1963, *Pac. Insects*, 5 (1): 236. ♀ only. (Type locality: Lae, 10 m., NE New Guinea.)

A medium-sized, yellow and brown species, differing from *hardyi* only in the following: scutum with faint fuscous markings on caudoscutal area,

fuscous spot on midportion of fore femur absent, no strong apical spines on mid and hind fourth tarsal segments, all female claws equal, spermatheca larger.

Distribution: Known only from the type locality.

CHECKLIST OF DESCRIBED SPECIES OF *Echinohelea* MACFIE

- australensis* Debenham, n. sp. (A.C.T. and N.S.W., Australia).
flava Tokunaga, 1963, *Pac. Insects*, 5 (1): 235 (New Britain).
harbelensis de Meillon, 1960, *J. ent. Soc. S. Africa*, 23 (2): 409 (Liberia).
hardyi Tokunaga, 1963, *Pac. Insects*, 5 (1): 235 (New Guinea).
laensis Tokunaga, 1963, *Pac. Insects*, 5 (1): 236 (New Guinea).
lanei Wirth, 1951, *Proc. ent. Soc. Washington*, 53 (6): 319 (Virginia, U.S.A.).
longirostris Debenham, n. sp. (New Guinea).
macfiei Lane, 1948, *Arg. Fac. Hig. S. Pub. Univ. Sao Paulo*, 1: 228 (Brazil).
moresbyensis Debenham, n. sp. (New Guinea).
notipes Debenham, n. sp. (Queensland, Australia).
ornatipennis Macfie, 1940, *Proc. r. ent. Soc. Lond.*, (B), 9 (11): 188 (Guyana).
pallida Debenham, n. sp. (New Guinea).
papuensis Tokunaga, 1966, *Pac. Insects*, 8 (1): 112 (New Guinea).
pictipennis Tokunaga, 1963, *Pac. Insects*, 5 (1): 231 (New Guinea).
richardsi Macfie, 1940, *Proc. r. ent. Soc. Lond.*, (B), 9 (11): 189 (Guyana).
smartii Macfie, 1940, *Proc. r. ent. Soc. Lond.*, (B), 9 (11): 190 (Guyana).
voltana de Meillon, 1959, *Novos Taxa Entomologicos*, 13: 15 (Lower Volta).
zonata Tokunaga, 1963, *Pac. Insects*, 5 (1): 234 (New Guinea).

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